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Effect of Anti Diuretic Hormon (ADH) in Kidney Function on Post Hemodialysis End Stage Renal Failure Disease (ESRD) Iraqi Patients

Tiba. A. Kh. Al-Taiee*, Nawal. M.J Al-Shammaa

Department of Chemistry, College of Pure Sciences Education Ibn Al- Haitham, University of Baghdad, Baghdad , Iraq

Abstract

Chronic renal disease (CRD) is a patho-physiologic process with multiple etiologies, resulting in the inexorable attrition of Nephron number and function and frequently leading to end-stage renal disease (ESRD). In turn, ESRD represents a clinical state or condition in which there has been an irreversible loss of endogenous renal function, of a degree sufficient to render the patient permanently dependent upon renal replacement therapy (dialysis or transplantation) in order to avoid life threatening uremia. The current study was applied on 80 patients, the age range within 25-70 years, selected sample of patients who attend Iraqi center of kidney dialysis, Baghdad Teaching Hospital and Al-Yarmok Teaching Hospital . All the patients body mass index [BMI] were measured. Serum anti diuretic hormone ADH was assessed using enzyme linked immunosorbent kit [Elisa], and urea, creatinine, albumin, hemoglobin were determined by spectrophotometer (PD-303), and sodium, potassium, chloride were determined by Electrolyte analyzer. The study patients were divided into two groups : GA include the healthy subjects as a control and GB include the post dialysis ESRD patients . The results showed a highly significant increase in ADH , Urea and Creatinine levels in GB when compared with the control and highly significant decrease in albumin and hemoglobin levels in GB when compared with the control. Non -significant decrease in sodium and potassium levels in GB when compared with the control, while highly significant increase in chloride level in GB when compared with the control.

Keywords: Anti Diuretic Hormone, Kidney Function (Urea, Creatinine, albumin), Hemoglobin and Electrolyte (sodium, potassium, chloride).

تأثير هرمون المضاد للأدرار على المرحلة الأخيرة للفشل الكلوي في مرحلة ما بعد غسيل الكلى للمرضى العراقيين

طبيبة عبد الرحمن خضير الطائي*، نوال محمد جواد الشماع

قسم الكيمياء، كلية التربية للعلوم الصرفة ابن الهيثم، جامعة بغداد، بغداد، العراق

الخلاصة

مرض الكلى المزمن (CRD) هو مرض فسيولوجي متعدد الاسباب ويؤدي الى استنزاف عدد من الوحدات الكبيبية وكثيرا ما يؤدي إلى الداء الكلوي بمرحلة الأخيرة. يمثل الداء الكلوي بمرحلة الأخيرة حالة سريرية وفقدان وظائف الكلى الداخلية بالشكل الذي يجعل المريض يحتاج الى غسيل الكلى بشكل دائم لتجنب خطورة ارتفاع اليوريا في الدم أو زراعة الكلى تم تطبيق الدراسة الحالية على 80 مريضاً ، الفئة العمرية

*Email: tibataiee92@gmail.com

من ٢٥-٧٠ سنة ، العينة مختارة من المرضى الذين يحضرون مركز غسيل الكلى في العراق ، مستشفى بغداد التعليمي ومستشفى اليرموك التعليمي وقياس مؤشر كتلة الجسم للمرضى [BMI]، مصلى الهرمون المضاد للادرار تم تقييمها باستخدام مجموعة مناعية مرتبطة بالأنزيم [Elisa] بينما تم فحص اليوريا والكرياتينين والألبومين والهيموغلوبين بواسطة مقياس الطيف الضوئي (PD-303) والصوديوم والبوتاسيوم والكلوريد تم تحديدها بواسطة محلل إلكتروني. تم تقسيم المرضى في مجموعة واحدة B كدالة بعدية مع الداء الكلوي بمراحله الأخيرة ، ومجموعة A كسيطرة. اظهرت النتائج زيادة معنوية كبيرة في مستويات هرمون ADH و اليوريا و الكرياتينين لدى مجموعة المرضى بالمقارنة مع مستواه لدى مجموعة السيطرة، وانخفاض معنوي كبير في الالبومين والهيموغلوبين لدى مجموعة المرضى بالمقارنة مع مستواه لدى مجموعة السيطرة، وانخفاض غير معنوي في الصوديوم والبوتاسيوم لدى مجموعة المرضى بالمقارنة مع مستواه لدى مجموعة السيطرة، في حين هناك زيادة معنوية عالية في الكلورايد لدى مجموعة المرضى بالمقارنة مع مستواه لدى مجموعة السيطرة.

Introduction

Anti-Diuretic Hormone is a crucial hormone in human body aiding essential physiological functions such as homeostasis of fluid balance, vascular tonus and organization of endocrine stress response. Two basic functions of ADH, blood circulation which is filtered in the nephrons, and the other is to raise blood pressure. The renal role in increasing the amount of water re-absorbed back to the pressure arterial and increases the resistance of peripheral blood vessels, This is occur through the narrowing of the arteries [1]. ESRD is the last stage of long-term chronic renal disease and in which losing the renal functions, making the patient depend on the renal dialysis to avoid accumulation of waste and toxins in the blood that lead to loss of patient life. There are several Causes for ESRD Includes: atherosclerosis, immune diseases, kidney disorders and painkillers [2, 3]. Hemodialysis is the process by which all the toxins and impurities from the patient's blood are removed. This process is done two times a week for 3-4 hours per session. It may help balance body fluids with the necessary minerals, sodium, potassium, calcium and chloride and also help control blood pressure [4]. Urea is a small molecules dissolved in water, It consist of pair-nitrogen atoms, and it is the last product of nitrogen and protein metabolism in the liver. Through the glomerulus , urea is filtered and reuptake in nearby and distant nephrons. In nearby tubule a great portion of the filtered urea is absorbed in medulla collecting duct [5, 6]. Creatinine is a break-down of creatinine phosphate in muscle tissue, filtered via the glomerulus and little amounts of it is products excreted through proximal tubules in glomerular filtration [7]. Albumin is a protein that makes up a big proportion of the plasma proteins found in the blood in a huge amounts, which are output in liver. Blood volume is organized by serum albumins thought the preservation of osmotic pressure and is therefore a key factor in controlling the interchange of water among interstitial vacuum and plasma [8]. Anemia occurs when have a decreased level of hemoglobin in red blood cells (RBCs) caused by iron shortage in the blood, which in turn leads to a lowering in the formed of heme. Malnutrition, frequent blood loss, renal failure, sickle cell anemia or thalassemia are all the causes of anemia [9]. The renal possess a turn in regulation of chloride ion, when the appearance of any disorder or imbalance in level electrolyte means that is to the presence of damage in the renal, or other reasons impact to the disability of the kidneys to preserve the balance of Cl^{-1} as intensive drought or diabetes [10]. Sodium participates in organizing water balance in the body these lead the water is pumped inside the cell, it is also important in acid-base balance and in the body's osmotic balance, which contributes to plasma volume regulation. Although there are several important roles of sodium in the body, but the abundance and quality in the renal patients is harmful because of the disability of the kidneys to filtered the sodium ions and other excess fluids, so the existing of any disorder in renal function causes defect in sodium levels [11,12]. The body utilizes potassium that needed, and removed the surplus of its need by the renal via the bloodstream. when there is a lack of kidney effectiveness, the inability to filter this surplus from potassium leads to a high levels of K^{+} in the bloodstream, several causes for Low potassium in blood, is potassium lost in urine due to drug that increase urination is the most causes common [13]. The aim of the present work is to investigate the effect of Anti Diuretic Hormone (ADH) on kidney functions (Urea, Creatinine ,Albumin), Hemoglobin, Electrolyte (sodium, potassium, chloride) on End Stage Renal Failure Disease (ESRD) in post hemodialysis.

Material and Methods

Patients

The current study was applied on 80 patients, the age range within 25-70 years, selected sample of patients who attend Iraqi center of kidney dialysis , Baghdad Teaching Hospital and Al-Yarmok Teaching Hospital for the period from October 2017 to January 2018. All the patients body mass index [BMI] were measured. Serum anti diuretic hormone ADH was assessed using enzyme linked immunosorbent kit [Elisa] while urea, creatinine, albumin, hemoglobin were determined by spectrophotometer (PD-303), and sodium, potassium, chloride were determined by Electrolyte analyzer 9180. These patients were divided in two groups B as post dialysis with ESRD, and group A as healthy control.

Blood sample collection

Five ml of venous blood sample Were collected from all the study s subjects , transferred into gel tube, allowed to stand for 25 minutes at room temperature then centrifuged at 4000 rpm for 10 minutes. The resulting serum suppurated and frozen at -40°C Until used for Biochemical parameters estimation of level ADH, Urea, Creatinine, Albumin, hemoglobin, electrolyte [Na^+ , CL^- , K^+].

Statistical analysis

The Statistical analysis system SPSS version 20. T.test chi- square program was used to study the effect difference factors in study parameters. In this study, the correlation coefficient estimated between Different parameter [14].

Results and Discussion

Results showed a highly significant increase in G_B when comparing with G_A in ADH, urea and creatinine, while highly significant decrease in G_B when comparing with G_A in albumin and hemoglobin as shown in Table-1 and Figure-1.

Table 1-Level of ADH, Urea, Creatinine, Albumin and Hemoglobin with ESRD patients and control group.

Parameters	Group A (G_A)	Group B (G_B)	P-value
ADH Pg/ml	32.33 ± 0.88	37.42 ± 6.53	0.012
Urea mg/dl	30.20 ± 5.02	49.50 ± 21.9	0.079
Creatinine mg/dl	3.36 ± 0.76	5.24 ± 2.29	0.017
Albumin g/l	4.43 ± 0.59	3.13 ± 0.44	0.001
Hemoglobin g/l	9.96 ± 0.27	8.56 ± 0.98	0.001

($P \leq 0.05$) significant(S), ($P \geq 0.05$)non-significant(N.S), ($P \leq 0.01$)highly significant (H.S).

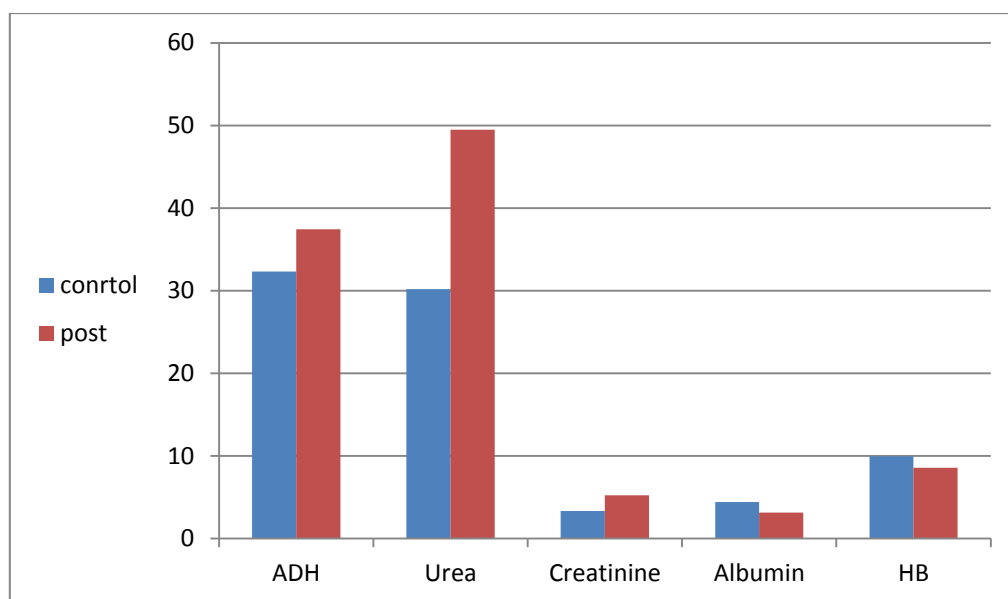


Figure 1- comparison between patient ESRD and control group for ADH, Urea, Creatinine, Albumin and Hemoglobin

Earlier data showed to patients ESRD after dialysis sera ADH, urea and creatinine levels are higher than healthy control. Previous studies, There are previous studies that agree with our findings are Yamada K et al, Idania A. Arcari et al and Raja Tahir Mahmood et al respectively, to ADH, urea and creatinine levels [15-17]. subsequent data confirm this finding and indicated that the elevated levels of ADH were related to osmolality due increased concentration of salts and proteins in the blood increases the storage of water in the body and thus leads to lower kidney function and increased secretion of ADH. This means that increased osmolality leads to a significant increase in ADH levels because osmolality is the main regulator of ADH release [18,19]. While urea and creatinine levels are related to glomerular filtration rate (GFR), due to the decrease in the number of nephrons working in the kidneys, which in turn reduce the rate of glomerular filtration (GFR), thus the kidneys unable on blood purification and removed waste so that the accumulation of waste and toxic chemicals in the blood, causing dysfunction in the kidneys as called renal failure [20, 21]. Also data showed of observed albumin and hemoglobin levels are lower than healthy, the reduction level of albumin is related with reduced renal function. When renal syndrome occurs, the kidneys stop functioning. Albumin is lost in the urine, leading to a decrease in the level of albumin in the blood [22]. While reduction level of hemoglobin is related with anemia occurs in patients with renal failure because the kidneys are responsible for the secretion of the hormone erythropoietin (EPO), which is responsible for the formation of red blood cells. When kidney function is deficiency, the number of red blood cells production decreases, causing a decrease in the level of hemoglobin leading to anemia [23, 24]. Results in Table-2 and Figure-2 observed non-significant decrease in G_B when comparing with G_A in sodium and potassium, while highly significant increase in G_B when comparing with G_A in chloride.

Table 2- Level of Sodium, Potassium and Chloride with ESRD patients and control group.

Parameters	Group A (G_A)	Group B (G_B)	P-value
Na^+ mmol/L	139.5 ± 2.67	112.2 ± 10.2	0.446
K^+ mmol/L	3.93 ± 0.34	3.14 ± 1.02	0.978
Cl^- mmol/L	100.6 ± 2.36	112.2 ± 10.2	0.001

($P \leq 0.05$) significant(S), ($P \geq 0.05$) non-significant (N.S), ($P \leq 0.01$) highly significant (H.S)

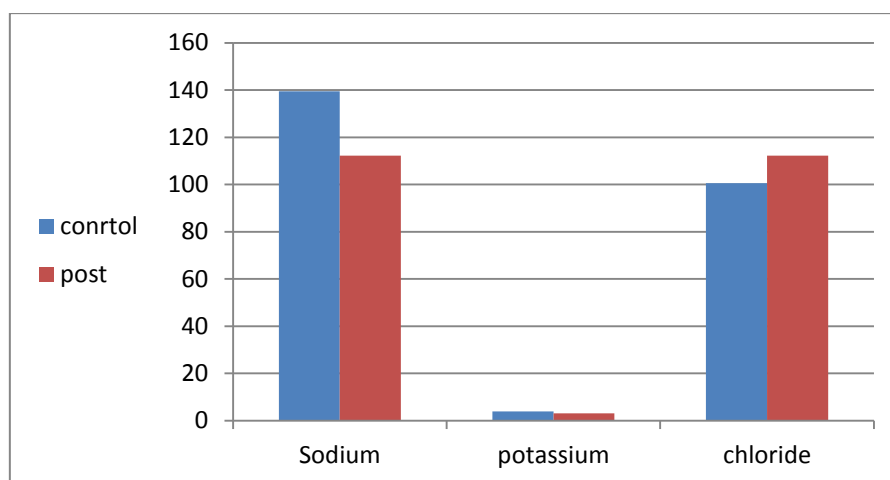


Figure 2- comparison between patient ESRD and control group for Sodium, Potassium and Chloride.

The data show a decrease in sodium and potassium levels after dialysis compared with health control. Previous studies support these findings, study Ravel VA et al and Dolson GM et al [25, 26]. Low sodium in the blood leads to the kidneys secretion angiotensin which causes the adrenal cortex to secrete aldosterone, the latter induces the renal tubules to reabsorb sodium from the glomerular filtrate. when renal dysfunction occurs, the amount of water in the blood increases, leading to a decrease in the blood volume, thus lowering the level of sodium which works on high blood pressure, because sodium is responsible for regulating blood pressure [27]. While potassium levels in the blood decrease due to the removal of excess potassium in the kidneys through the dialysis device, loss of the digestive system of potassium as a result of vomiting is also an important cause of low blood levels [28].

Conclusion

In this study, Serum ADH, creatinine and Cl^{-1} levels were highly significant increase in post dialysis, serum Urea level was non-significant increase in post dialysis, serum albumin and hemoglobin levels were highly significant decrease in post dialysis, and serum Na^{+} and K^{+} levels was non-significant decrease in post dialysis compared to healthy control.

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